T. W. WILLIAMS.
Furnaces.

No. 211,074. Patented Dec. 17, 1878.

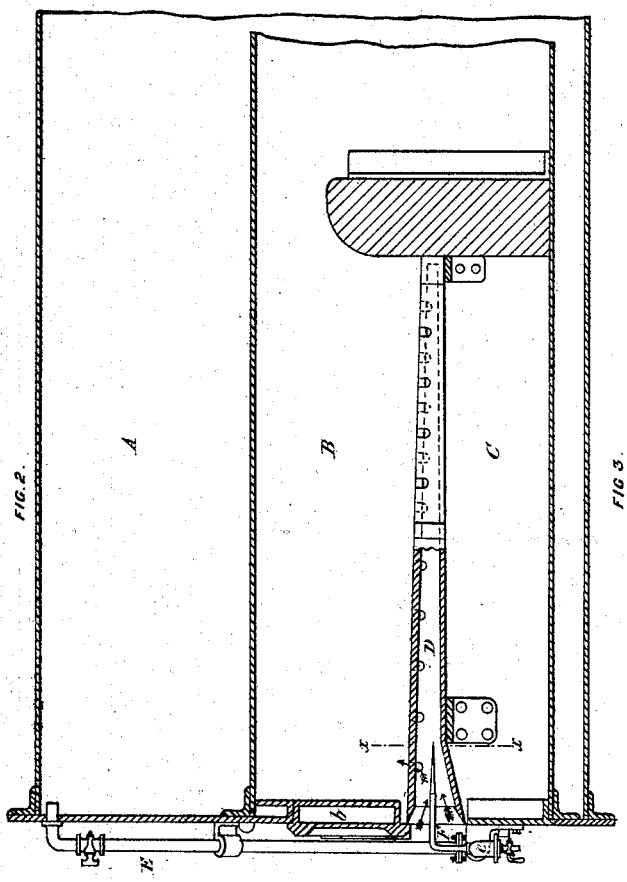

FIG. 2.

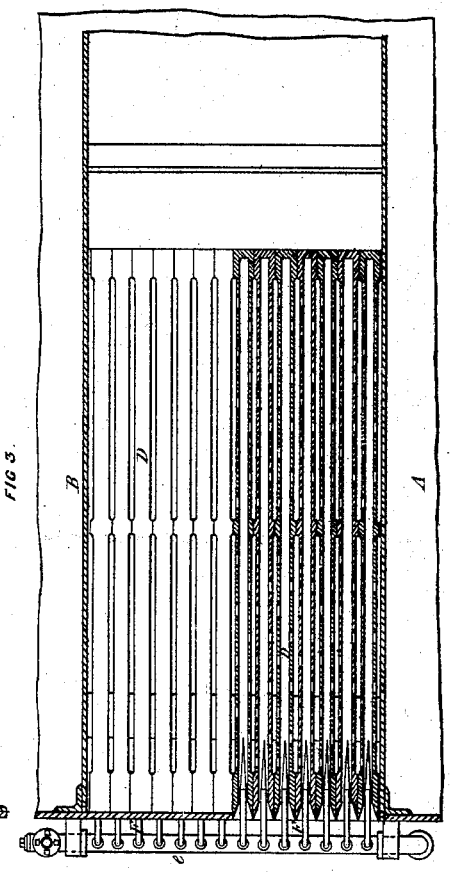

FIG. 3.

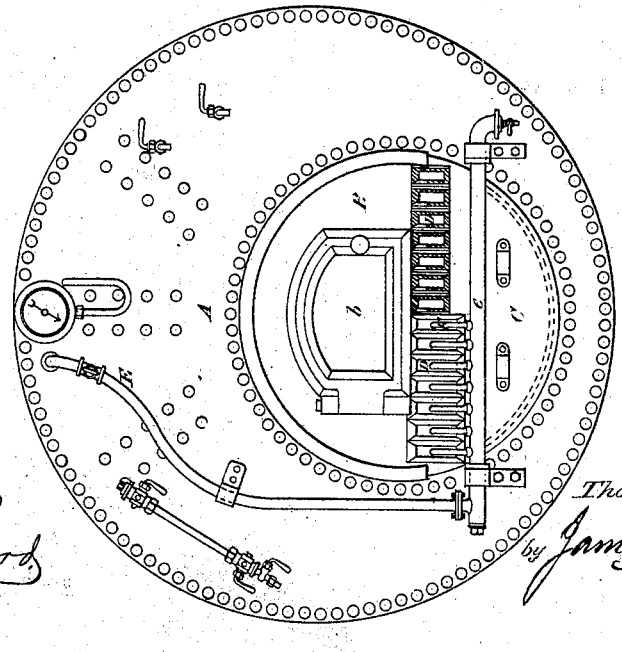

FIG. 1.

Scale ½ — 1".

Witnesses:
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UNITED STATES PATENT OFFICE.

THOMAS W. WILLIAMS, OF SWANSEA, WALES, GREAT BRITAIN.

IMPROVEMENT IN FURNACES.

Specification forming part of Letters Patent No. **211,074**, dated December 17, 1878; application filed March 9, 1878; patented in England, February 8, 1878.

To all whom it may concern:

Be it known that I, THOMAS WATKIN WILLIAMS, of Swansea, in the county of Glamorgan, Wales, Great Britain, have invented certain new and useful Improvements in the Construction of Furnaces, of which the following is a specification, which forms the subject of an English patent dated February 8, 1878.

My said invention relates to certain improvements in the construction of furnaces, whereby important advantages are obtained with great economy and simplicity as compared with the arrangements hitherto employed, while at the same time a great saving is effected in the amount of fuel consumed.

The grate of the furnace is constructed with hollow perforated fire-bars, which are, by preference, of a slightly-tapered form, the diameter of the outer ends, which are, respectively, formed with bell-shaped mouths, being greater than that of the inner ends. A tube is connected with the steam-space or other convenient part of the boiler, from which steam can be obtained in such a manner as to allow of its being brought down to the front of the same a little below the bell-shaped mouths of the fire-bars, and to be carried horizontally in front of the latter. The horizontal portion of the said tube is provided with apertures corresponding in number to that of the fire-bars, and into which apertures are fixed small tubes, the opposite ends thereof being provided with nozzles. These tubes are fixed vertically, or nearly so, until they are opposite the centers of the fire-bars, when they are bent at right angles in such a manner that the nozzles pass through the centers of the bell-shaped mouths to the required distance, as will be well understood.

When it is required to bring the said arrangements into operation steam is admitted into the first-mentioned tube, the supply thereof being regulated by means of valves adapted for the purpose. The steam then issues through the smaller tubes and nozzles into the bell-shaped mouths of the fire-bars with such force as to create a partial vacuum, the external atmospheric air passing into the same through the said bell-shaped mouths, and, together with the steam, through the perforations in the fire-bars, into and among the superincumbent mass of incandescent fuel, the result being that the perfect combustion of the fuel is greatly facilitated, and the bars being kept cool are preserved from the injurious effects of the great heat generated.

Instead of providing one tube or nozzle only for each fire-bar two or more of different lengths may be employed, the same being connected with the horizontal tube in a manner similar to that before described. Such additional tubes or nozzles may be advantageously employed when the fire-bars are of unusual length. Instead of having the tubes or nozzles entirely separate from the fire-bars the same may be cast in one piece therewith.

In cases in which my said invention is applied to locomotive-engines, both ends of the fire-bars may be open and respectively provided with the apparatus before described, and when the same is in operation at one end of the fire-bars the other end of the latter may be closed by means of shutters. By these means the engine may be worked in either direction.

Results of a very important nature are secured by means of my said invention. The fire-bars are kept constantly cool when even anthracite coal is employed, the combustion of the same being completely effected by the operation of the apparatus hereinbefore described. By reason of the bars being kept cool the operation of the apparatus is almost noiseless, and by reason of a perfect combustion of the fuel being obtained coal of inferior qualities may be used.

The apparatus above described may be employed in combination with boilers constructed with or without combustion-chambers.

I will now proceed to refer to the annexed drawings, from which the nature of my said invention will be more clearly understood.

Figure 1 is a front elevation of a boiler, showing half the fire-bars in section, taken through the line *x x* in Fig. 2. Fig. 2 is a longitudinal section, showing half the fire-bar in section; and Fig. 3 is a plan of the grate, showing one-half of the fire-bars in section.

The same letters of reference indicate similar parts in the several figures.

A is the boiler; B, the furnace; *b*, the door thereof, and C the ash-pit. D are the hollow

perforated fire-bars; E, the tube leading from the steam-space, and *e* the horizontal portion of the same, which is placed below the line of fire-bars, in order to collect any water which may result from the condensation of the steam, and to prevent the same from priming the smaller tubes, and from being forced into the fire-bars, and by being so placed it offers no impediment to the passage of the air into the bell-shaped mouths. Pet-cocks are provided for drawing off the water. F are the smaller tubes and nozzles.

My said invention will, in practice, be found to possess a great advantage as compared with the ordinary under-grate blower, inasmuch as in cases where there is a powerful natural draft the same may be utilized as an auxiliary, and thus secure economy of operation.

It should be mentioned that in most cases in which my said invention is used it will be found desirable to close the ash-pits of the grates.

I claim as my invention—

The combination and arrangement of the tube E *e* and the series of smaller tubes and nozzles F projecting into the hollow perforated tapering fire-bars of furnaces, substantially as and for the purposes hereinbefore set forth and described.

THOMAS WATKIN WILLIAMS.

Witnesses:

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